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SUBCHAPTER 9. GROUND WATER MONITORING REQUIREMENTS FOR SANITARY LANDFILLS

7:14A-9.1 Scope and Purpose

(a) This subchapter establishes the requirements for conducting ground water monitoring at sanitary landfills, including design of the ground water monitoring system, sampling, parameters and frequency of analyses, evaluation of data, recordkeeping and reporting.

(b) It is essential that the monitoring program provide adequate data over a sufficient period of time to accurately represent conditions and variations of background ground water quality and the hydrologic characteristic of the sanitary landfill. It is essential that the monitoring program be sufficient to ensure protection of ground water resources.

7:14A-9.2 Applicability

(a) The requirements in this subchapter apply to all sanitary landfills, except as provided at (c), (d) and (e) below.

(b) All sanitary landfills shall obtain a NJPDES DGW permit to conduct ground water monitoring as specified in this subchapter.

(c) Ground water monitoring pursuant to N.J.A.C. 7:14A-9.3 through 9.8 will be suspended for a municipal solid waste landfill (MSWLF) if the owner or operator can demonstrate that there is no potential for migration of any hazardous constituents from the MSWLF to the uppermost aquifer during the active life of the unit and the post-closure care period. This demonstration shall be certified by a qualified ground water scientist and approved by the Department and shall be based upon:

1. Site specific field collected measurements, sampling and analysis of physical, chemical, and biological processes affecting the contaminant fate and transport; and

2. Contaminant fate and transport predictions that maximize contaminant migration and consider impacts on human health and environment.

(d) For a sanitary landfill that is not a MSWLF under 40 CFR Parts 257 and 258, the Department may waive the requirement to sample for the complete list of Appendix A parameters when in detection mode, and for the complete list of the 40 C.F.R. 258 Appendix II parameters when in assessment or corrective monitoring mode. When the Department grants such a waiver, based upon the known characteristics of the waste and leachate quality, the contamination

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potential of the site, or historical permit conditions, the Department shall provide an alternate list of parameters to be monitored that are consistent with those factors. All sanitary landfills remain subject to all other requirements of N.J.A.C. 7:14A-9.3 through 9.8.

(e) The Department shall exempt a sanitary landfill from the requirement to obtain or maintain a NJPDES permit to conduct ground water monitoring as required by this subchapter when a ground water monitoring program equivalent to the provisions of this subchapter or 40 C.F.R. 258, whichever is more stringent, is being conducted pursuant to the requirements of the Industrial Site Recovery Act (N.J.S.A. 13:1K-6 et seq., as amended), the Spill Compensation and Control Act (N.J.S.A. 58:10-23.11), or the Procedures for Department Oversight of the Remediation of Contaminated Sites at N.J.A.C. 7:26C.

(f) For the purposes of this subchapter, a "qualified ground water scientist" is a scientist or engineer who has received a baccalaureate or post-graduate degree in the natural sciences or engineering and has sufficient training and experience in ground water hydrology as may be demonstrated by state registration, professional certifications, or completion of accredited university programs that enable the individual to make sound professional judgments regarding ground water monitoring, containment fate transport, and corrective action.

7:14A-9.3 Ground water monitoring system performance standards

(a) A ground water monitoring system shall consist of a sufficient number of wells, installed at appropriate locations and depths, to yield ground water samples from the uppermost aquifer that:

1. Represent the quality of background ground water that has not been affected by leakage. A determination of background ground water quality may include sampling of wells that are not hydraulically upgradient of the solid waste facility area where:

   i. Hydrogeologic conditions do not allow the owner or operator to determine what wells are hydraulically upgradient; or

   ii. Sampling at other wells will provide an indication of background ground water quality that is as representative or more representative than that provided by the upgradient wells; and

2. Represent the quality of ground water passing the relevant point of compliance specified by the Department under N.J.A.C. 7:14A-9.6. The downgradient monitoring system shall be installed at the relevant point of compliance specified by the Department that ensures detection of ground water contamination in the uppermost aquifer. When physical obstacles preclude installation of ground water monitoring wells at the relevant

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point of compliance, the down-gradient monitoring system may be installed at the closest practicable distance hydraulically down-gradient from the relevant point of compliance specified by the Department that ensures detection of ground water contamination in the uppermost aquifer

(b) The Department shall approve a multiunit ground water monitoring system instead of separate ground water monitoring systems for each MSWLF when the facility has several units, provided the multiunit ground water monitoring system meets the requirement of (a) above and shall be as protective of human health and the environment as individual monitoring systems for each MSWLF, based on the following factors:

1. The number, spacing, and orientation of the sanitary landfills;

2. The hydrogeologic setting;

3. The site history;

4. The engineering design of the sanitary landfills; and

5. The type of waste accepted at the sanitary landfills.

(c) Monitoring wells shall be cased in a manner that maintains the integrity of the monitoring well bore hole. This casing shall be screened or perforated and packed with gravel or sand, where necessary, to enable collection of ground water samples. The annular space (that is, the space between the bore hole and well casing) above the sampling depth shall be sealed to prevent contamination of samples and the ground water. In addition to these general well construction standards, all monitoring wells shall be constructed in accordance with the edition of the Department's "Field Sampling Procedures Manual" applicable at the time of construction, an alternate method approved by the Department, or as set forth in the NJPDES-DGW permit.

1. The owner or operator of a sanitary landfill shall notify the Department that the design, installation, development, and decommissioning of any monitoring wells, piezometers and other measurement, sampling, and analytical devices documentation has been placed in the records maintained by the facility; and

2. The monitoring wells, piezometers, and other measurement, sampling, and analytical devices shall be operated and maintained so that they perform to design specifications for the duration of the monitoring program.

(d) The number, spacing, and depths of monitoring systems shall be:

1. Determined based upon site specific technical information that shall include thorough characterization of:

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i. Aquifer thickness, ground water flow rate, ground water flow direction including seasonal and temporal fluctuations in ground water flow; and

ii. Saturated and unsaturated geologic strata and fill materials overlying the uppermost aquifer, materials comprising the uppermost aquifer, and materials comprising the confining bed defining the lower boundary of the uppermost aquifer including but not limited to: thickness, stratigraphy, lithology, hydraulic conductivity, porosity and effective porosity.

(e) The ground water monitoring system shall perform in accordance with the standards established in this section, and shall consist of a minimum of four monitoring wells, placed such that there is one background quality well, and three hydraulically downgradient wells, located in the uppermost aquifer into which a discharge or leak is likely to occur.

(f) In addition to the minimum number of wells stated in (e) above, additional wells may be required in order to satisfy the performance standards for a ground water monitoring system in N.J.A.C. 7:14A-9.3(a). The number and spacing of these additional wells shall be capable of intercepting a contaminant plume emanating from a leachate leak located at the most downgradient edge of the waste area. This spacing shall be determined as specified in (d) above.

(g) The Department shall waive the requirements of (e) and (f) above based upon one of the following:

1. Performance of geophysical methods of analysis such as resistivity/conductivity that indicate or confirm that there are no contaminant leaks, or when there are leaks or discharges, that wells are placed in the most concentrated zones of any and all contaminant plumes emanating from the landfill; or

2. Another acceptable method approved in advance by the Department that demonstrates that the minimum number of monitoring wells is not necessary to indicate whether or not the landfill is leaking. A high quality contaminant transport model is one example of an acceptable method.

(h) The adequacy of the monitoring system shall be certified by a qualified ground water scientist and/or approved by the Department. The certification shall indicate that the performance standards of this section, or of the permit, are met. Within 14 days of this certification, the owner or operator shall notify the Department that the certification has been placed in the records maintained by the facility.

(a) In addition to monitoring requirements specified elsewhere in this subchapter, the following requirements shall apply to installation, maintenance, sampling

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and closure of monitoring wells:

1. Ground water monitoring wells shall be constructed in accordance with the edition of the Department's "Field Sampling Procedures Manual" applicable at the time of well construction, an alternate method approved by the Department, or as set forth in the NJPDES-DGW permit.

2. A well permit, as required by N.J.S.A. 58:4A-1 et seq., shall be obtained prior to the installation of any ground water monitoring well. A clear and accurate record or base map providing any monitoring well location, depth, elevation and achievable pumping rate shall be kept at the facility by the owner or operator and be made available to the Department.

3. Ground water sampling shall be conducted in accordance with the edition of the Department's "Field Sampling Procedures Manual" applicable at the time of well sampling, an alternate method approved by the Department, or as set forth in the NJPDES-DGW permit.

4. Wells shall be capped to prevent precipitation from entering the well bore hole or introduction of extraneous material and substances into the well which might invalidate analytical results. All monitoring wells shall be cased in a manner that maintains the integrity of the monitoring well bore hole. Wells shall be screened and packed with gravel or sand where necessary to enable sample collection at depths where appropriate. The annular space (that is, the space between the bore hole and well casing) above the sampling depth shall be sealed with a suitable material (for example, cement grout or bentonite slurry) to prevent contamination of samples and ground water.

5. The elevation of the top of the well casing for each ground water monitoring well shall be established and said elevation shall be permanently marked on the well casing. The elevation established shall be in relation to the New Jersey Geodetic Control Survey datum. Each monitoring well casing shall be permanently marked with a number assigned or approved by the Department. This number will typically be the well permit number issued with the permit to construct the well.

7:14A-9.5 Ground water Monitoring Program Requirements for Sanitary Landfills

(a) The ground water monitoring program shall include sampling and analysis procedures that are designed to ensure monitoring results that provide an accurate representation of ground water quality at the background and downgradient wells installed in compliance with N.J.A.C. 7:14A-9.3(a). The owner or operator shall notify the Department, pursuant to the NJPDES permit, that the sampling and analysis program documentation has been placed in the operating record and the program shall include procedures and techniques for:

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1. Sample collection;

2. Sample preservation and shipment;

3. Analytical procedures;

4. Chain of custody control; and

5. Quality assurance and quality control.

(b) The ground water monitoring program shall include sampling and analytical methods that are appropriate for ground water sampling and that accurately measure hazardous constituents and other monitoring parameters in ground water samples. Ground water samples shall not be field filtered prior to laboratory analysis.

(c) The sampling procedures and frequency shall be protective of human health and the environment.

(d) Ground water elevations shall be measured in each well immediately prior to purging, each time ground water is sampled. The owner or operator shall determine the rate and direction of ground water flow each time ground water is sampled Ground water elevations in wells which monitor the same area shall be measured within a period of time short enough to avoid temporal variations in ground water flow which could preclude accurate determination of ground water flow rate and direction.

(e) The owner or operator shall establish background ground water quality in a hydraulically upgradient or background well(s) for each of the monitoring parameters or constituents required in the particular ground water monitoring program that applies to the sanitary landfill, as determined pursuant to N.J.A.C. 7:14A-9.7(a) or 9.8(a). Background ground water quality may be established at wells that are not located hydraulically upgradient from the sanitary landfill if it meets the requirements of N.J.A.C. 7:14A-9.3(a)1.

(f) The number of samples collected to establish ground water quality data shall be consistent with the appropriate statistical procedures determined pursuant to (g) below. The sampling procedures shall be those specified under N.J.A.C. 7:14A-9.7(b) for detection monitoring, N.J.A.C. 7:14A-9.8(b) and (d) for assessment monitoring, and N.J.A.C. 7:14A-9.9(b) for corrective measures.

(g) The owner or operator shall specify in the records maintained by the facility one of the following statistical methods to be used in evaluating ground water monitoring data for each hazardous constituent. The statistical test shall be conducted separately for each hazardous constituent in each well. Guidance for selecting and conducting the appropriate tests, and for evaluating the results of the tests is described in detail in Statistical Analysis of Ground Water

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Monitoring Data At RCRA Facilities—Interim Final Guidance Document, 4/89 (NTIS #PB 89-151-047. EPA/530-SW-89-026).

1. A parametric analysis of variance (ANOVA) followed by multiple comparison procedures to identify statistically significant evidence of contamination. The method shall include estimation and testing of the contrasts between the mean and the background mean levels for each compliance well for each constituent;

2. An analysis of variance (ANOVA) based on ranks followed by multiple comparisons procedures to identify statistically significant evidence of contamination. The method shall include estimation and testing of the contrasts between each compliance well's median and the background median levels for each compliance well for each constituent;

3. A tolerance or prediction interval procedure in which an interval for each constituent is established from the distribution of the background data, and the level of each constituent in each compliance well is compared to the upper tolerance or prediction limit;

4. A control chart approach that gives control limits for each constituent; or

5. Another statistical test method that meets the performance standards of (h) below. The owner or operator shall place a justification for this alternative in the records maintained by the facility and notify the Department, pursuant to the NJPDES permit, of the use of this alternative test. The justification shall demonstrate that the alternative method meets the performance standards of (h) below.

(h) Any statistical method chosen pursuant to (g) above shall comply with the following performance standards, as appropriate:

1. The statistical method used to evaluate ground water monitoring data shall be appropriate for the distribution of chemical parameters or hazardous constituents. If the distribution of the chemical parameters or hazardous constituents is shown by the owner or operator to be inappropriate for a normal theory test, then the data must be transformed or a distribution free theory test must be used. If the distributions for the constituents differ, more than one statistical method shall be needed.

2. If an individual well comparison procedure is used to compare an individual compliance well constituent concentration with background constituent concentrations or a ground water protection standard, the test shall be done at a type I error level no less than 0.01 for each testing period. If a multiple comparisons procedure is used the type I experiment wise error rate for each testing period shall be no less than 0.05. However, the type I error of no less than 0.01 for individual well

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comparison shall be maintained. The performance standard does not apply to tolerance intervals, prediction intervals or control charts.

3. If a control chart approach is used to evaluate ground water monitoring data, the specific type of control chart and its associated parameter values shall be protective of human health and the environment. The parameters shall be determined after considering the number of samples in the background data base, the data distribution, and the range of the concentration values for each constituent of concern.

4. If a tolerance interval or a prediction interval is used to evaluate ground water monitoring data, the levels of confidence and, for tolerance intervals, the percentage of the population that the interval shall contain shall be protective of human health and the environment. These parameters shall be determined after considering the number of samples in the background data base, the data distribution, and the range of the concentration values for each constituent of concern.

5. The statistical method shall account for data below the limit of detection with one or more statistical procedures that are protective of human health and the environment. Any practical quantitation limit (PQL) that is used in the statistical method shall be the lowest concentration level that can be reliably achieved within specified limits of precision and accuracy during routine laboratory operating conditions that are available to the facility.

6. If necessary, the statistical method shall include procedures to control or correct for seasonal and spatial variability as well as temporal correlation in the data.

(i) The owner or operator shall determine whether or not there is a statistically significant increase over background values for each parameter or constituent required in the particular ground water monitoring program that applies to the sanitary landfill, as determined under N.J.A.C. 7:14A-9.7(a) or 9.8(a).

1. In determining whether a statistically significant increase has occurred, the owner or operator shall compare the ground water quality of each parameter or constituent at each monitoring well designated pursuant to N.J.A.C. 7:14A-9.3(a)2 to the background value of that constituent, according to the statistical procedures and performance standards specified at (g) and (h) above.

2. Within a reasonable period of time after completing sampling and analysis, not to exceed 90 days unless otherwise approved by the Department in writing, the owner or operator shall determine whether there has been a statistically significant increase over background at each monitoring well.

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7:14A-9.6 Relevant Point of Compliance

(a) The relevant point of compliance for a MSWLF shall be no more than 150 meters from the actual disposal area and shall be located on land owned by the owner of the sanitary landfill. In determining the relevant point of compliance, the Department shall consider the following factors:

1. The hydrogeologic characteristics of the facility and the surrounding land;

2. The volume and physical and chemical characteristics of the leachate;

3. The quantity, quality and direction of flow of ground water;

4. The proximity and withdrawal rate of the ground water users;

5. The availability of alternative drinking water supplies; and

6. The existing quality of the ground water, including other sources of contamination and their cumulative impacts on the ground water, and whether the ground water is currently used or reasonably expected to be used for drinking water.

(b) The relevant point of compliance for sanitary landfills that are not MSWLFs shall be the sanitary landfill property boundary, but when possible, shall be no more than 150 meters from the actual disposal area within the "set back" as defined in N.J.A.C. 7:26-1.6.

7:14A-9.7 Leak Detection Monitoring Program

(a) Leak detection monitoring is required at sanitary landfills at all ground water monitoring wells installed as part of a ground water monitoring system established pursuant to N.J.A.C. 7:14A-9.3(a)1 and 2. At a minimum, a detection monitoring program shall include the monitoring for the constituents listed in Appendix A to this subchapter, incorporated herein by reference.

1. The Department shall remove any of the Appendix A monitoring parameters for a sanitary landfill if it can be shown that the removed constituents are not reasonably expected to be in or derived from the waste contained in the sanitary landfill unit.

2. The Department will establish an alternative list of inorganic indicator parameters for a sanitary landfill, in lieu of some or all of the heavy metals (constituents 1 through 15 in Appendix A to this subchapter), if the alternative parameters provide a reliable indication of inorganic releases from the sanitary landfill to the ground water. In determining alternative parameters, the Department shall consider the following factors:

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i. The types, quantities, and concentrations of constituents in wastes managed at the sanitary landfill;

ii. The mobility, stability, and persistence of waste constituents or their reaction products in the unsaturated zone beneath the sanitary landfill;

iii. The detectability of indicator parameters, waste constituents and reaction products in the ground water; and

iv. The concentration or values and coefficients of variation of monitoring parameters or constituents in the ground water background.

(b) The monitoring frequency for all constituents listed in Appendix A to this subchapter, or in the alternative list approved in accordance with (a)2 above, shall be at least semiannual during the active life of the facility (including closure) and the post closure period. A minimum of four independent samples from each well (background and downgradient) shall be collected and analyzed for the Appendix A constituents, or the alternative list approved in accordance with (a)2 above during the first semiannual sampling event. At least one sample from each well (background and downgradient) shall be collected and analyzed during subsequent semiannual sampling events. The Department will specify an appropriate alternative frequency for repeated sampling and analysis for Appendix A constituents, or the alternative list approved in accordance with (a)2 above during the active life (including closure) and the post closure care period. The alternative frequency during the active life (including closure) shall be no less than annual. The alternative frequency shall be based on consideration of the following factors:

1. The lithology of the aquifer and unsaturated zone;

2. The hydraulic conductivity of the aquifer and unsaturated zone;

3. The ground water flow rates;

4. The minimum distance between upgradient edge of the sanitary landfill and downgradient monitoring well screen (minimum distance of travel), and

5. The resource value of the aquifer.

(c) If the owner or operator of a sanitary landfill determines, pursuant to N.J.A.C. 7:14A-9.5(g), that there is a statistically significant increase over background for one or more of the constituents listed in Appendix A-Part A to this subchapter or in the alternative list approved in accordance with (a)2 above, at any monitoring well at the boundary specified under N.J.A.C. 7:14A-9.3(a)2,

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the owner or operator shall:

1. Within 14 days of this finding, place a notice in the records maintained by the facility indicating which constituents have shown statistically significant changes from background levels, and notify the Department that this notice was placed in the operating record; and

2. Establish an assessment monitoring program meeting the requirements of N.J.A.C. 7:14A-9.8 within 90 days except as provided at (d) below.

3. The owner or operator may demonstrate that a source other than a sanitary landfill caused the contamination or that the statistically significant increase resulted from error in sampling, analysis, statistical evaluation, or natural variation in ground water quality. A report documenting this demonstration shall be certified by a qualified ground water scientist or approved by the Department and be placed in the records maintained by the facility. If a successful demonstration is made and documented the owner or operator may continue detection monitoring as specified in this section. If, after 90 days, a successful demonstration is not made, the owner or operator shall initiate an assessment monitoring program as required in N.J.A.C. 7:14A-9.8.

7:14A-9.8 Assessment Monitoring Program

(a) Assessment monitoring is required whenever a statistically significant increase over background has been detected for one or more of the constituents listed in Appendix A to this subchapter or in the alternative list established in accordance with N.J.A.C. 7:14A-9.7(a)2.

(b) Within 90 days of initiating an assessment monitoring program, and annually thereafter, the owner or operator shall sample and analyze the ground water for all constituents identified in 40 C.F.R. 258 Appendix II. A minimum of one sample from each downgradient well shall be collected and analyzed during each sampling event. For any constituent detected in the downgradient wells as a result of the complete 40 C.F.R. 258 Appendix II analysis a minimum of four independent samples from each well (background and downgradient) shall be collected and analyzed to establish background for the constituents. The Department will specify an appropriate subset of wells to be sampled and analyzed for 40 C.F.R. 258 Appendix II constituents during assessment monitoring. The Department will remove any of the 40 C.F.R. 258 Appendix II monitoring parameters for a sanitary landfill if it can be shown that the removed constituents are not reasonably expected to be in or derived from the waste contained in the unit.

(c) The Department will specify an appropriate alternate frequency for repeated sampling and analysis for the full set of 40 C.F.R. 258 Appendix II constituents required to be monitored pursuant to (b) above, during the active

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life (including closure) and post closure care of the unit based on the following factors:

1. The lithology of the aquifer and unsaturated zone;

2. The hydraulic conductivity of the aquifer and unsaturated zone;

3. The ground water flow rate;

4. The minimum distance between upgradient edge of the sanitary landfill and downgradient monitoring well screen (minimum distance of travel);

5. The resource value of the aquifer; and

6. The nature (fate and transport) of any constituents detected.

(d) After obtaining the results from the initial or subsequent sampling required pursuant to (b) above, the owner or operator shall:

1. Within 14 days, place a notice in the records maintained by the facility identifying the 40 C.F.R. 258 Appendix II constituents that have been detected and notify the Department that this notice has been placed in the records maintained by the facility;

2. Within 90 days, and on at least a semiannual basis thereafter, resample all wells installed as part of the ground water monitoring system established pursuant to N.J.A.C. 7:14A-9.3(a) and conduct analyses for all constituents in Appendix A to this subchapter or in the alternative list established pursuant to N.J.A.C. 7:14A-9.7(a)2, and for those constituents in 40 C.F.R. 258 Appendix II that are detected in response to (b) above and record their concentrations in the records maintained by the facility. At least one sample from each well (background and downgradient) shall be collected and analyzed during these sampling events. The Department will specify an alternative monitoring frequency during the active life (including closure) and the post closure period for the constituents referred to in this paragraph. The alternative frequency for Appendix A constituents or the alternative list established pursuant to N.J.A.C. 7:14A-9.7(a)2 during the active life (including closure) shall be no less than annual. The alternative frequency shall be based on consideration of the factors specified at (c) above;

3. Establish background concentrations for any constituents detected pursuant to (b) or (d) above; and

4. Establish ground water protection standards for all constituents detected pursuant to (b) or (d) above. The ground water protection standards shall be established in accordance with (h) below, or when available, shall be

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the Ground Water Quality Standards set forth in N.J.A.C. 7:9C.

(e) If the concentrations of all 40 C.F.R. 258 Appendix II constituents are shown to be at or below background values, using the statistical procedures set forth at N.J.A.C. 7:14A-9.5(g), for two consecutive sampling events, the owner or operator shall notify the Department of this finding and may resume detection monitoring pursuant to N.J.A.C. 7:14A-9.7.

(f) If the concentrations of any 40 C.F.R. 258 Appendix II constituents are above background values, but all concentrations are below the ground water protection standard established pursuant to (h) below using the statistical procedures in N.J.A.C. 7:14A-9.5(g), the owner or operator shall continue assessment monitoring in accordance with this section.

(g) If one or more 40 C.F.R. 258 Appendix II constituents are detected at statistically significant levels above the ground water protection standards established pursuant to (d) 4 above in any sampling event, the owner or operator shall within 14 days of this finding, place a notice in the records maintained by the facility identifying the 40 C.F.R. 258 Appendix II constituents that have exceeded the ground water protection standard and notify the Department and all appropriate local government officials that the notice has been placed in said records.

1. The owner or operator shall also:

   i. Characterize the nature and extent of the release by installing additional monitoring wells as necessary;

   ii. Install at least one additional monitoring well at the facility boundary in the direction of contaminant migration and sample this well in accordance with (d)(2) above;

   iii. Notify all persons who own the land or reside on the land that directly overlies any part of the plume of contamination if contaminants have migrated off-site as indicated by sampling of wells in accordance with this subsection; and

   iv. Initiate an assessment of corrective measures as required by N.J.A.C. 7:14A-9.9 within 90 days; or

2. The owner or operator may demonstrate that a source other than a sanitary landfill unit caused the contamination, or that the statistically significant increase resulted from error in sampling, analysis, or natural variation in ground water quality. A report documenting this demonstration shall be certified by a qualified ground water scientist or approved by the Department and placed in the records maintained by the facility. If a successful demonstration is made, the owner or operator shall continue

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monitoring in accordance with the assessment monitoring program established pursuant to this section, and may resume to detection monitoring if the40 C.F.R. 258 Appendix II constituents are at or below background as specified at (e) above. Until a successful demonstration is made, the owner or operator shall comply with (g) above, including initiating an assessment of corrective measures.

(h) Ground water protection standards for each 40 C.F.R. 258 Appendix II parameter shall be determined according to the criteria in N.J.A.C. 7:9C or in accordance with 40 C.F.R. 258.55(h) through (i), whichever is more stringent.

7:14A-9.9 Assessment of Corrective Measures.

(a) Within 90 days of finding that any of the constituents listed in 40 C.F.R. 258 Appendix II have been detected at a statistically significant level exceeding the ground water protection standards under N.J.A.C. 7:14A-9.8(h), the owner or operator shall initiate an assessment of corrective measures. Such assessment shall be completed within a reasonable period of time, not to exceed 90 days unless otherwise approved by the Department in writing.

(b) The owner or operator shall continue to monitor in accordance with the assessment monitoring program specified in N.J.A.C. 7:14A-9.8.

(c) The assessment shall include an analysis of the effectiveness of potential corrective measures in meeting all of the requirements and objectives of the remedy as described under N.J.A.C. 7:14A-9.10, addressing at least the following:

1. The performance, reliability, ease of implementation, and potential impacts of appropriate potential remedies, including safety impacts, cross-media impacts, and control of exposure to any residual contamination;

2. The time required to begin and complete the remedy;

3. The costs of remedy implementation; and

4. The institutional requirements such as State or local permit requirements or other environmental or public health requirements that may substantially affect implementation of the remedy(s).

(d) The owner or operator shall discuss the results of the corrective measures assessment, prior to the selection of remedy, in a public meeting with interested and affected parties.

7:14A-9.10 Selection of remedy

(a) Based on the results of the assessment of corrective measures conducted

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pursuant to N.J.A.C. 7:14A-9.9, the owner or operator shall select a remedy that, at a minimum, meets the standards listed at (b) below. The owner or operator shall notify the Department, within 14 days of selecting a remedy, that a report describing the selected remedy has been placed in the records maintained by the facility and how it meets the standards in (b) below.

(b) Remedies shall:

1. Be protective of human health and the environment;

2. Attain the ground water protection standard specified pursuant to N.J.A.C. 7:14A-9.8(h);

3. Control the source(s) of releases so as to reduce or eliminate, to the maximum extent practicable, further releases of 40 C.F.R. 258 Appendix II constituents into the environment that may pose a threat to human health or the environment;

4. Comply with standards for management of wastes specified in N.J.A.C. 7:14A-9.11(d); and

5. Be implemented in accordance with provisions in the solid waste facility permit, or the closure plan approval issued in accordance with N.J.A.C. 7:26.

(c) In selecting a remedy that meets the standards of (b) above, the owner or operator shall consider the following factors:

1. The long and short term effectiveness and protectiveness of the potential remedy(s), along with the degree of certainty that the remedy will prove successful based on:

i. The magnitude of reduction of existing risks;

ii. The magnitude of residual risks in terms of likelihood of other releases due to waste remaining following implementation of a remedy:

iii. The type and degree of long term management required, including monitoring, operation, and maintenance;

iv. The short term risks that might be posed to the community, workers, or the environment during implementation of such a remedy, including potential threat to human health and the environment associated with excavation, transportation, and redisposal or containment;

v. The time until full protection is achieved;

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vi. The potential for exposure of humans and environmental receptors to remaining wastes, considering the potential threat to human health and the environment associated with excavation, transportation, redisposal, or containment;

vii. The long term reliability of the engineering and institutional controls; and

viii. The potential need for replacement of the remedy.

2. The effectiveness of the remedy in controlling the source to reduce further releases based on:

i. The extent to which containment practices will reduce further releases; and

ii. The extent to which treatment technologies may be used.

3. The ease or difficulty of implementing a potential remedy(s) based on:

i. The degree of difficulty associated with constructing the technology;

ii. The expected operational reliability of the technology;

iii. The need to coordinate with and obtain necessary approvals and permits from other agencies;

iv. The availability of necessary equipment and specialists; and

v. The available capacity and location of needed treatment, storage, and disposal services.

4. The practicable capability of the owner or operator, including a consideration of the technical and economic capability.

5. The degree to which community concerns are addressed by a potential remedy(s).

(d) The owner or operator shall specify as part of the selected remedy a schedule(s) for initiating and completing remedial activities. Such a schedule shall specify the initiation of remedial activities within a reasonable period of time, not to exceed 90 days unless otherwise approved by the Department in writing, taking into consideration the factors set forth in (d) (1)-(8) below:

1. The extent and nature of contamination;

2. The practical capabilities of remedial technologies in achieving compliance with ground water protection standards established under

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N.J.A.C. 7:14A-9.8(g) or (h) and other objectives of the remedy;

3. The availability of treatment or disposal capacity for wastes managed during implementation of the remedy;

4. The desirability of utilizing technologies that are not currently available, but which may offer significant advantages over already available technologies in terms of effectiveness, reliability, safety, or ability to achieve remedial objectives;

5. The potential risks to human health and the environment from exposure to contamination prior to completion of the remedy;

6. The resource value of the aquifer including:

   i. Current and future uses;

   ii. The proximity and withdrawal rate of users;

   iii. Ground water quantity and quality;

   iv. The potential damage to wildlife, crops, vegetation, and physical structures caused by exposure to waste constituent;

   v. The hydrogeologic characteristic of the facility and surrounding land;

   vi. Ground water removal and treatment costs; and

   vii. The cost and availability of alternative water supplies;

7. The practicable capability of the owner or operator; and

8. Other relevant factors.

(e) The Department shall determine that remediation of a release of a 40 CFR 258 Appendix II constituent from a sanitary landfill is not necessary if the owner or operator demonstrates to the satisfaction of the Department that:

1. The ground water is additionally contaminated by substances that have originated from a source other than a sanitary landfill and those substances are present in concentrations such that cleanup of the release from the sanitary landfill would provide no significant reduction in risk to actual or potential receptors;

2. The constituent(s) is present in ground water that:

   i. Is not currently or reasonable expected to be a source of drinking water; and

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ii. Is not hydraulically connected with waters to which the hazardous constituents are migrating or are likely to migrate in a concentration(s) that would exceed the ground water protection standards established under N.J.A.C. 7:14A-9.8(h);

3. Remediation of the release(s) is technically impracticable; or

4. Remediation results in unacceptable cross-media impacts.

(f) A determination by the Department pursuant to (e) above shall not affect the authority of the State to require the owner or operator to undertake source control measures or other measures that may be necessary to eliminate or minimize further releases to the ground water, to prevent exposure to the ground water, or to remediate the ground water to concentrations that are technically practicable and significantly reduce threats to human health or the environment.

(g) When ground water contamination is known to have migrated outside the sanitary landfill boundary, the sanitary landfill shall request to conduct a cleanup in accordance with the Procedures for Department Oversight of the Remediation of Contaminated Sites at N.J.A.C. 7:26C within 90 days unless it can be demonstrated that a source other than the MSWLF caused the contamination, or that the statistically significant increase resulted from error in sampling, analysis, statistical evaluation, or natural variation in ground water quality. A report documenting this demonstration shall be certified by a qualified ground water scientist or approved by the Department and placed in the records maintained by the facility.

7:14A-9.11 Implementation of the Corrective Action Program

(a) Based on the schedule established under N.J.A.C. 7:14A-9.10(d) for initiation and completion of remedial activities, the owner/operator shall:

1. Establish and implement a corrective action ground water monitoring program that:

i. At a minimum, meets the requirements of an assessment monitoring program under N.J.A.C. 7:14A-9.8;

ii. Indicates the effectiveness of the corrective action remedy; and

iii. Demonstrates compliance with ground water protection standards pursuant to (e) below;

2. Implement the corrective action remedy selected under N.J.A.C. 7:14A-9.10; and

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3. Take any interim measures necessary to ensure the protection of human health and the environment. Interim measures shall, to the greatest extent practicable, be consistent with the objectives of and contribute to the permanence of any remedy that may be required pursuant to N.J.A.C. 7:14A-9.10. The following factors shall be considered by an owner or operator in determining whether interim measures are necessary:

   i. The time required to develop and implement a final remedy;

   ii. The actual or potential exposure of nearby populations or environmental receptors to hazardous constituents;

   iii. The actual or potential contamination of drinking water supplies or sensitive ecosystems;

   iv. The further degradation of the ground water that may occur if remedial action is not initiated expeditiously;

   v. Weather conditions that may cause hazardous constituents to migrate or be released;

   vi. The risks of fire or explosion, or potential for exposure to hazardous constituents as a result of an accident or failure of a container or handling system; and

   vii. Other situations that may pose threats to human health and the environment.

(b) An owner or operator may determine, based on information developed after implementation of the remedy has begun or other information, that compliance with N.J.A.C. 7:14A-9.10(b) is not being achieved through the remedy selected. In such a case, the owner or operator shall implement other methods or techniques that could practicably achieve compliance with the requirements, unless the owner or operator makes the determination under (c) below.

(c) If the owner or operator determines that compliance with N.J.A.C. 7:14A-9.10(b) cannot be practically achieved with any currently available methods, the owner or operator shall:

1. Obtain certification of a qualified ground water scientist or approval by the Department that compliance with N.J.A.C. 7:14A-9.10(b) cannot be practically achieved with any currently available methods;

2. Implement alternate measures to control exposure of humans or the environment to residual contamination, as necessary to protect human health and the environment;

3. Implement alternate measures for control of the sources of contamination,

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or for removal or decontamination of equipment, units, devices, or structures that are:

i. Technically practicable; and

ii. Consistent with the overall objective of the remedy; and

4. Notify the Department within 14 days that a report justifying the alternative measures prior to implementing such alternative measures has been placed in the records maintained by the facility.

(d) All solid wastes that are managed pursuant to a remedy required under N.J.A.C. 7:14A-9.10, or an interim measure required under (a)3 above, shall be managed in a manner that:

1. Is protective of human health and the environment; and

2. Complies with applicable RCRA requirements.

(e) Remedies selected pursuant to N.J.A.C. 7:14A-9.10 shall be considered complete when:

1. The owner or operator complies with the ground water protection standards established under N.J.A.C. 7:14A-9.8(h) at all points within the plume of contamination that lie beyond the ground water monitoring well system established pursuant to N.J.A.C. 7:14A-9.3(a);

2. Compliance with the ground water protection standards established under N.J.A.C. 7:14A-9.8(h) has been achieved by demonstrating that concentrations of 40 C.F.R. 258 Appendix II constituents have not exceeded the ground water protection standard(s) for a period of three consecutive years using the statistical procedures and performance standards in N.J.A.C. 7:14A-9.5(g) and (h). The Department will specify an alternative length of time during which the owner or operator shall demonstrate that concentrations of 40 C.F.R. 258 Appendix II constituents have not exceeded the ground water protection standard(s) taking into consideration:

i. Extent and concentration of the release(s);

ii. Behavior characteristics of the hazardous constituents in the ground water

iii. Accuracy of monitoring or modeling techniques, including any seasonal, meteorological, or other environmental variabilities that may affect the accuracy; and

iv. Characteristics of the ground water; and

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3. All actions required to complete the remedy have been satisfied.

(f) Upon completion of the remedy, the owner or operator shall notify the Department within 14 days that a certification that the remedy has been completed in compliance with the requirements of N.J.A.C. 7:14A-9.11(e) has been placed in the records maintained by the facility. The certification shall be signed by the owner or operator and by a qualified ground water scientist or approved by the Department.

(g) When, upon completion of the certification, the owner or operator determines that the corrective action remedy has been completed in accordance with the requirements of (e) above, the owner or operator shall be released from the requirements for financial assurance for corrective action under 40 CFR 258.73.

7:14A-9.12 Application Requirements For NJPDES-DGW Permits for Sanitary Landfills

(a) In addition to the information required pursuant to N.J.A.C. 7:14A-4.3, an applicant for a NJPDES-DGW sanitary landfill monitoring permit shall ensure that the Department has in its possession maps, cross sections and reports as follows. Maps may be combined if all required features are clearly shown.

1. A location map:

i. The site shall be located on a U.S. Geological Survey 7.5 minute series Topographic Quadrangle. The quadrangle shall be the most recent revision.

ii. The site shall be shown by legal boundaries surveyed by a New Jersey licensed land surveyor indicating roadways, adjacent property ownerships and all inhabited structures and facilities within one half mile of site boundaries.

2. A topographic map(s):

i. The topographic map of the facility shall have a horizontal scale of at least one inch equals 200 feet and a contour interval of five feet. Contour elevations shall be based on established N.J. Geological Control Survey Datum and the map shall be keyed into the New Jersey State plane coordinate systems. The topographic map(s) shall indicate original, existing, and proposed topography.

ii. An additional topographic map shall indicate all surface waters within one-half mile of the sanitary landfill site and all water supply reservoirs and public recreational bodies of water within one mile of the landfill boundary;

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3. A ground water supply map showing the depth and location of wells within one-half mile radius and all public supply wells or wells permitted to pump over 100,000 gallons per day or 70 gallons per minute within 1½ miles of the proposed sanitary landfill shall be plotted. Pump capacity or diversion allocation for all wells yielding greater than 70 gallons per minute shall be reported and keyed to the map. All occupied buildings, including private dwellings, within one-half mile radius of the proposed sanitary landfill facility shall be plotted and identified as to type (for example, industrial, commercial, or residential). The service areas, if any, of municipal or community water supply systems shall be identified;

4. A detailed geologic map of the entire site, including all the area outside the sanitary landfill site boundary to a distance of one-half mile. The base data for this map shall be compiled by a geologist. The scale of the geologic map shall be at least one inch equals 400 feet and shall show the following information:

    i. Bedrock outcrops;

    ii. Dip and strike of sedimentary formations and foliation trends and dip angles of igneous and metamorphic rocks;

    iii. Fault(s) and prominent shear zone(s) trends;

    iv. Joint or fracture trends in bedrock outcrops including dip angles;

    v. The trend direction of solution channels in carbonate rocks and sink holes;

    vi. The location of any active or abandoned mine workings; and

    vii. A geologic report describing the major characteristics of the formation(s), including thickness, lithology, structural features, degree of weathering, and amount of overburden;

5. Geologic cross-section(s) and fence diagrams, preferably in three dimensions, showing the spatial relationship of the sanitary landfill, the geology, the monitoring wells, any other engineered site improvements, or other significant features that influence the interpretation of analytical results and explanations;

6. Soils map and borings:

    i. A soils map shall be submitted with a scale of at least one inch equals 400 feet. Soils information should be drawn from the U.S.D.A. Soil Conservation Service Report(s) with site specific soils data determined by a soil scientist using the U.S.D.A. textural

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classification system on data obtained from the required borings and other available data.

ii. A sufficient number of borings necessary to determine soil characteristics, depth to bedrock (where applicable), permeability and ground water elevations shall be drilled. Where, in the judgment of the Department, submitted information is insufficient to adequately evaluate the site, additional and/or deeper borings, supplemented by excavations, test pits or geophysical methods will be required.

(1) Subsurface data obtained by borings shall be collected by split spoon drive method, shelby tube or diamond bit coring. Auger borings are not acceptable.

(2) All borings shall be a minimum depth of 10 feet below the seasonally high water table. In no case shall borings be less than 20 feet below the lowest elevation by the sanitary landfill.

(3) Split spoon, shelby tube and diamond bit core samples shall be labeled and properly stored for a minimum period of one year from the date of the permit application.

(4) Profiles shall be shown for each boring giving the depths and texture of each soil stratum or horizon and the elevation of any ground water or aquifer encountered, and shall include the date each boring was taken;

7. A hydrogeologic report shall be provided for the site and for a one-half mile radius of the proposed site. The hydrogeologic report shall include:

i. A piezometric map based upon stabilized ground water elevations below the site showing direction(s) and rate(s) of ground water flow and an indication as to whether the ground water is unconfined, confined (artesian) or both for the proposed sanitary landfill;

ii. A generalized piezometric map based upon available data including, but not limited to, existing topography, surface drainage and existing well data, shall be provided for the area within one-half mile radius of the site boundary;

iii. A survey of wells identified on the ground water supply map prepared pursuant to (b)3 above including the use, approximate yield, and depth of each well; and

iv. All public water supplies and wells capable of pumping over 70 gallons per minute or 100,000 gallons per day within a 1 ½ mile

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radius of the sanitary landfill, including an assessment of the potential impact on those supplies by the sanitary landfill;

8. Maps showing the location of all existing and proposed ground water monitor wells; and

9. Results of leachate generation calculations provided by performing a water balance calculation such as the Hydrologic Evaluation of Landfill Performance (HELP) Model, EPA/600/9-94/xxx, U.S. Environmental Protection Agency Risk Reduction Engineering Laboratory, Cincinnati, OH.

10. Leachate generation calculations shall be provided by performing a water balance calculation.

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7:14A-9 APPENDIX A - CONSTITUENTS FOR DETECTION MONITORING

Part A Parameters: Inorganic Constituents

Number	Common Name[1]	CAS RN[2]
1	Antimony	(Total)
2	Arsenic	(Total)
3	Barium	(Total)
4	Beryllium	(Total)
5	Cadmium	(Total)
6	Chromium	(Total)
7	Cobalt	(Total)
8	Copper	(Total)
9	Lead	(Total)
10	Nickel	(Total)
11	Selenium	(Total)
12	Silver	(Total)
13	Thallium	(Total)
14	Vanadium	(Total)
15	Zinc	(Total)

Organic Constituents

16	Acetone	67-64-1
17	Acrylonitrile	107-13-1
18	Benzene	71-43-2
19	Bromochloromethane	74-97-5
20	Bromodichloromethane	75-27-4
21	Bromoform; Tribromomethane	75-25-2
22	Carbon disulfide	75-15-0
23	Carbon tetrachloride	56-23-5
24	Chlorobenzene	108-90-7
25	Chloroethane; Ethyl chloride	75-00-3
26	Chloroform; Trichloromethane	67-66-3
27	Dibromochloromethane; Chlorodibromomethane	124-48-1
28	1,2-Dibromo-3-chloropropane; DBCP	96-12-8
29	1,2-Dibromoethane; Ethylene dibromide; EDB	106-93-4
30	o-Dichlorobenzene; 1,2-Dichlorobenzene	95-50-1
31	p-Dichlorobenzene; 1,4-Dichlorobenzene	106-46-7
32	trans-1,4-Dichloro-2-butene	110-57-6
33	1,1-Dichloroethane; Ethylidene chloride	75-34-3
34	1,2-Dichloroethane; Ethylene dichloride	107-06-2
35	1,1-Dichloroethylene; 1,1-Dichloroethene Vinylidene chloride	75-35-4
36	cis-1,2-Dichloroethylene; cis-1,2-Dichloroethene	156-59-2

[1] This list contains 47 volatile organics for which possible analytical procedures provided in EPA Report SW-846 'Test Methods for Evaluating Solid Waste,' third edition, November 1986, as revised December 1987, includes Method 8260; and 15 metals for which SW-846 provides either Method 6010 or a method from the 7000 series of methods. Common names are those widely used in government regulations, scientific publications, and commerce; synonyms exist for many chemicals.

[2] Chemical Abstracts Service registry number. Where 'Total' is entered, all species in the ground water that contain this element are included.

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37	trans-1,2-Dicloroethylene; trans-1,2-Dichloroethene	156-60-5
38	1,2-Dichloropropane; Propylene dichloride	78-87-5
39	cis-1,3-Dichloropropene	10061-01-5
40	trans-1,3-Dichloropropene	10061-02-6
41	Ethylbenzene	100-41-4
42	2-Hexanone; Methyl butyl ketone	591-78-6
43	Methyl bromide; Bromomethane	74-83-9
44	Methyl chloride; Chloromethane	74-87-3
45	Methylene bromide; Dibromomethane	74-95-3
46	Methylene chloride; Dichloromethane	75-09-2
47	Methyl ethyl ketone; MEK; 2-Butanone	78-93-3
48	Methyl iodide; Iodomethane	74-88-4
49	4-Methyl-2-pentanone; Methyl isobutyl ketone	108-10-1
50	Styrene	100-42-5
51	1,1,1,2-Tetrachloroethane	630-20-6
52	1,1,2,2-Tetrachloroethane	79-34-5
53	Tetrachloroethylene; Tetrachloroethene; Per- chloroethylene.127-18-4	127-18-4
54	Toluene	108-88-3
55	1,1,1-Trichloroethane; Methylchloroform	71-55-6
56	1,1,2-Trichloroethane	79-00-5
57	Trichloroethylene; Trichloroethene	79-01-6
58	Trichloro-fluoromethane; CFC-11	75-69-4
59	1,2,3,-Trichloropropane	96-18-4
60	Vinyl accetate	108-05-4
61	Vinyl chloride	75-01-4
62	Xylenes	1330-20-7

Part B Parameters

Ammonia (as N)	
Nitrate (as N)	
Total Dissolved Solids (TDS)	
Conductivity	